

2

Fry's Photographic Manuals.

No. 1.

77.1

LANTERN SLIDES

HOW TO MAKE THEM.

Second Edition (Tenth Thousand), Revised by the Author.

By A. R. DRESSER M.S.L., (Lond.)

PUBLISHED BY
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PREFACE.

THE object of this little book is to put before beginners the simplest method of making Lantern Slides upon Gelatino-bromide Plates. How many pleasant hours I have devoted to this absorbing recreation I cannot tell, but the following pages are the outcome of my work. It is the hope that this experience may be useful that has led me to publish the means which, in my own hands, have been of most service.

The reader's obedient servant,

A. R. DRESSER.

November, 1890.

PREFACE TO SECOND EDITION.

THE first edition of this little Book upon "my Hobby" is exhausted, and a further issue is required. Here it is, with revisions and additions to bring it up to date, and the compliments of

The reader's obedient servant,

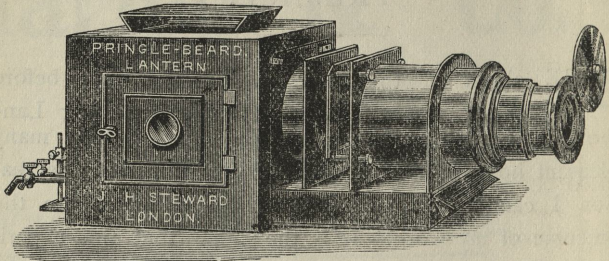
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December 25th, 1891.

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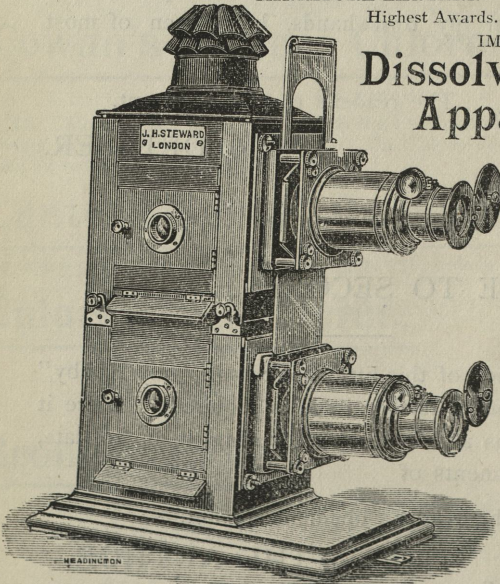
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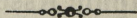
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the National Rifle Associations of England, Ireland, India, Canada, Australia,
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Glasgow and West of Scotland Amateur
Photographic Association,
180, West Regent St., Glasgow,
Nov. 20th, 1891.

Dear Sirs,

If I may venture to say so, you don't advertise your Lantern Plate enough. It was, I believe, in the market before some of the much advertised lantern plates, yet here it was unknown till lately, when one of our best slide-makers "discovered" it. In his hand and mine it has proved superior even to the———, which has hitherto been first favourite.

Yours truly,

WILLIAM GOODWIN.

B. J. Edwards & Co.,

The Grove, Hackney, London.

Lantern Slides: How to Make Them.

CHAPTER I.

INTRODUCTORY.

EVERYONE takes photographs in this year of grace 1891. To make a slide for exhibition in one's own lantern or that of the club to which one belongs follows as a necessary corollary. The introduction of a gelatine plate specially prepared and suitable for transparency work marked an epoch in the amateur craze, and it is to the gelatine plate as commercially sold I intend to confine my instructions. Whatever the merits of collodion transparencies, the convenience, price, and facilities offered by its rival process are too great and too many for it to successfully contend against. The theorist may argue in favour of collodion, the eclectic may decide for it, but the great bulk of every-day workers will plump for the commercial article, the gelatino-bromide lantern plate. My sympathies are with them, for I think that the man for whom a first-class gelatine slide is not good enough must be hard to please indeed.

Fry's lantern plate, as made and sold to-day, leaves so little to be desired, as far as technical qualities go, that I prefer to leave the task of sighing for the "good old

collodion" plate to others. Such a gelatino-bromide plate is good enough for me. One word of advice I would offer, and that is, "Choose a good brand of plate, and don't leave it. Each make has its peculiarities in working, and to become fully acquainted with these characteristic traits should be the leading idea in one's practice. This knowledge once acquired, half the difficulties are over; and so I repeat, select a good make, and stick to it.' The same line of reasoning applies to the choice of a developer. Let the reader make his selection from those hereafter enumerated, and then strive to master that particular formula. By adopting such a course he will be able to produce good slides at will from almost any negative, and that, I take it, is the object in view. The formulæ enumerated, and the whole process to be described, are my every-day practice. I have not included anything outside my own experience. Of the apparatus required I have endeavoured to give a description which, aided by illustrations, is sufficiently clear to enable any person to make it for himself. If preferred, he can get the local carpenter to make it for him at a trifling expense. A lantern for exhibiting the slides is necessary. One cannot always get one's slides tried just when required, and it is often a difficult matter to decide whether suitable density and detail have been obtained without actual trial in the lantern. It need not be an expensive instrument, but the condensers should be of four inches diameter, and the lens a non-distorting combination of six inches focus. I cannot recommend other than an oxy-hydrogen jet as source of

illumination. The gas can be easily obtained in steel bottles under pressure, and is not expensive. It has the advantage, moreover, of being always ready for use. Oil is too messy, and its smell is disagreeable. Of course the density of slides must be regulated to suit the strength of the light employed, be it gas or oil.

A screen for throwing the enlarged picture upon, can be easily made by straining a sheet, or, better still, painting a wall.

CHAPTER II.

RIVAL PROCESSES.

“**F**IRST catch your hare, then cook it.” Before a slide can be made it is necessary to have a negative to make it from. This it is assumed the reader has. There are two methods of making transparencies from a negative.

FIRST METHOD

By Contact, i.e., by placing the lantern plate in contact with the negative so that the sensitive film touches that of the negative, the dry plate receiving an exposure to actinic light through the negative in the same way exactly as a silver, albumen, platinum, or a bromide print does. The exposed plate has then to be developed just as if it had been exposed in the ordinary way in the camera. By this method one is limited to reproducing the negative exactly the same size as the original.

SECOND METHOD

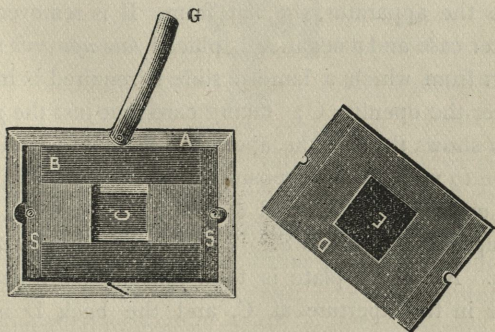
By Copying in the Camera. By this method either a part or the whole of the original negative may be reproduced and made to include more or less of the subject at will.

This method gives greater scope for the selection of good or excision of indifferent composition in the original, and, I think, gives greater technical excellence in the slide; but it involves the use of more apparatus, and is a longer method in practice. It also requires daylight to get the very best results with facility, although by the

method indicated in Chapter VI. great technical excellence may be secured. In the camera is the best method in the end and I recommend its adoption after the beginner has thoroughly mastered the elements of development (which are identical for both methods). He will thus begin to make slides by the contact method, and work on to the copying process as his experience increases.

FIRST METHOD—BY CONTACT.

For copying by contact a printing frame is required. An ordinary frame will do but it should be half plate size or larger, so that if a transparency from a portion only or a negative be required it can be done. Sometimes it is necessary for the sensitive plate to project over the edge of the negative. In such a case the use of a frame larger than the negative in use is imperative. It is however a convenience in working to use a frame specially constructed for the purpose. Such is Wormald's of which an illustration is given, the advantages are several and mainly consist



CONTACT PRINTING FRAME.

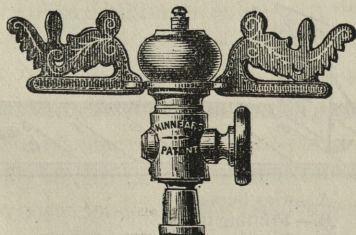
in facility in fixing the negative in position and a sure

method of placing the lantern plate in the same place upon the negative every time, and that without damaging the film of either the negative or the lantern plate.

A is a hard-wood case similar to an ordinary printing frame, and measuring about 10 inches by 8. It has an opening the size of a lantern plate at C. B is a flat frame or template about $\frac{1}{4}$ inch thick, which fits into the case A. This has also an opening at C the same size as that in the outside case. The use of this template is to fix the position of the lantern plate upon the negative. It has also two round holes at S, through which pass two screws or bolts, which are fastened to the outer case A. D is the cover or back of the frame, and is fitted with two recesses or grooves made to admit the screw-bolts S. At E is a projecting block, covered with cloth, which is just large enough to fit the opening at C when placed in it. The back is pressed into position by the brass spring G, which is attached to the outer case. To use the apparatus, the flat frame B is removed from the outer case and a negative is placed *face upwards* so that the part from which a lantern slide is required is in position over the opening C; taking care that just the *portion required* shows through the aperture. Without allowing the negative to move from its position, the flat frame B is then placed upon it, and fastened down by means of the milled heads upon the screws S S. The negative is now *fixed in position*. A lantern plate is then placed *film towards the negative* in the aperture at C, and the back D is then turned over and the block E pressed upon the lantern plate, and the whole fastened together by means of the

spring G. By means of this simple frame a number of lantern slides may be produced alike, as far as the position of the image is concerned.

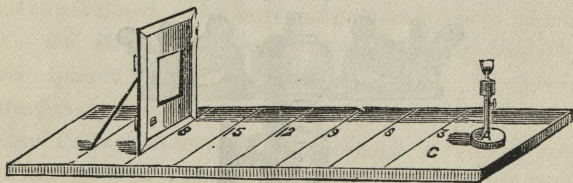
It is convenient, also, to have a box in which to enclose the paraffin lamp, or candle, with which the exposure is to be made. This box may best be described as a lantern in which the glass is replaced by some non-translucent material. If the Ruby Lantern which serves to illumine the developing room has a door which opens and closes in a convenient manner it may be utilised for this purpose. The object of this is that the photographic operator may be able to shut off the white light at will whilst he changes or develops his plates. If gas be available, a burner known as the "Matchless Self-lighting Gas Burner" is most con-



"MATCHLESS BURNER."

venient. It is a burner fitted with a bye-pass, so arranged that when the gas tap is turned off, a very small, and, as far as we are concerned, harmless, jet is left alight, ready to spring into a large actinic flame upon the turning of the tap again. By one of these contrivances the photographer will be enabled to give as many seconds exposure as the directions hereafter given will lead him to judge to be the correct one. It may here be noted that no exposure is

quite so good as the right one. Over-exposure, *i.e.*, the effect of the action of light too long continued, may be corrected by careful manipulation of the developer but for our purpose an approximately exact exposure is the only means by which good, rich tones can be secured. No remedial measures are satisfactory if the exposure be insufficient. It is a great point in favour of copying by contact that, having once ascertained the right exposure, it can be noted and repeated when more copies are required. By using the same light, and exposing the frame at the same distance from it, identical results may always be expected. For this purpose a board marked in feet and inches, and fitted at one end with a self-lighting burner, as indicated in the illustration, is very convenient.



A.—Gas burner.
B.—Printing frame.
C.—Board marked off in divisions.

It should be so arranged as to be capable of connection to a gas-pipe by means of an india-rubber tube, or, if a paraffin lamp be used, the place where the lamp is to stand should be marked. All that is necessary is to mark upon the negative the number of seconds exposure, and the distance of the frame from the light. From these data the exposure can then easily be correctly repeated at any time.

With regard to the distance between the exposing frame and the source of light, two factors have to be considered, the actinic strength of the light itself, and the density or thickness or light-resisting power of the negative. An image which is very dense requires the source of light to be rich in actinic rays. For a thin negative the reverse holds good. It is more convenient to increase the distance between the exposing frame and the light than to reduce the flame in size and brightness. Given a flame sufficiently actinic, its action can be readily modified by varying the intervening distance. A paraffin lamp with an inch wick, or a gas burner, consuming five feet per hour, is sufficiently actinic to penetrate a negative as dense as is generally met with. Occasionally it may be necessary to burn a piece of magnesium ribbon to print through a very thick or yellow negative, but this is not often imperative. The law which governs this point is as follows:—"The intensity of illumination on a given surface is *inversely* as the square of its distance from the source of light." Plainly stated this means that if at a distance of one foot from a gas jet or paraffin lamp an exposure of five seconds is correct, should the distance be increased to two feet, the corresponding exposure will be twenty seconds, *i.e.*, the original five seconds multiplied by two squared. If the distance be increased to three feet, the exposure will be five seconds, (the original exposure) multiplied by *three squared*, or, say, forty-five seconds. Stated proportionally, it stands thus—As the original distance is to the increased or decreased distance *squared*, so is the original exposure to the length of time which it

is desired to ascertain. As every school boy knows, the first two terms must be expressed in the same denomination—both in feet or both in inches.

$$\begin{array}{ccccccc}
 1 & : & 3^2 & :: & 5 & : & x \\
 & & 5 & \times & 3^2 & & \\
 x & = & \frac{\quad}{1} & = & 45 \text{ secs.} & &
 \end{array}$$

Theory indicates that the exposures given in the foregoing examples are equivalent, but there is this difference in practice, that light possesses less power of penetrating the densest portions of the negative as the distance increases, and we are able to make use of this property to modify the result obtained. "The less the distance between the source of light and the exposing frame, the less the contrast between the high lights and shadows in the resulting transparencies, and *vice versa*." The practice necessarily is—expose thick or dense negatives close to the source of light, say 12 inches; very thin negatives at some longer distance, say 36 to 48 inches. Between these distances for negatives of medium density. This is a question for the reader's judgment. Having indicated the lines upon which he must work, a few experimental exposures will give him the confidence of experience. There is one other method of modifying the action of the source of light, viz, by altering its colour. A blue light has a tendency to decrease the contrast—a yellow light the contrary. A piece of very pale blue glass and one of very light yellow to interpose between the light and the negative will therefore be an additional power, and are recommended accordingly. I trust that it will be clear

that there is considerable power of modifying the character of transparency, which may be obtained from any given plate. If the negative be very dense, by which I mean that the deposit is very thick, and obstructs a large amount of light, then the distance from the gas or lamp must be short. If, on the other hand, the negative be a thin and transparent one, the reverse of that just mentioned, then there must be a greater distance between the negative and the light. Should the negative be a hard one, by which the reader will understand that I mean one in which the transitions from high light to deep shadow are abrupt, then not only must the distance from the light be short, but the length of exposure must be prolonged, so as to minimise the contrast in the resulting transparency. Of course, the reverse must obtain if there be but little contrast between the lights and shadows that is if the negative be what is technically known as "soft," and in such a case the use of the lightly-tinted yellow glass will be found of great service. It must be observed that the use of a yellow glass very considerably increases the exposure.

CHAPTER III.

LANTERN SLIDES BY CONTACT—THE PRACTICE.

HAVING thus explained the principles upon which the printing exposure must be made, I shall now sketch out the general practice of making a lantern slide by contact. Suppose that from a quarter-plate negative it is required to make a slide. Examine the negative to see whether it is very dense, or the reverse. Let us suppose it is of full density. Carefully polish the back of negative. If there are any clear spots in the film, fill them with colour, using a camel-hair brush and Indian ink, so as to minimise or do away with their effect, and place the negative film upwards in a printing frame. Open a box of lantern plates (I use Fry's), and having dusted the surface of one, place it film downwards in contact with the negative; a pad of soft *dark* paper upon the plate, and the back of the frame over all, and shut it up. Here, let me observe, that it is almost imperative that each plate and the negative should be dusted with a broad camel-hair brush before being placed face to face. If neglected, dust spots will surely spoil fifty per cent of the finished slides. Place the frame opposite your gas jet at 12 inches distance and turn up the gas for 5 seconds by the watch. Turn down the gas and proceed to develop. Full details for development will be found in Chapter VII. It was assumed the negative was of full density; had it been

very thin I should have placed it 3 feet from the light and given a corresponding exposure (see *ante*), or if of medium density at 2 feet. If on development the exposure is found to be insufficient or too much, the remedy is obvious—increase or decrease it. If the contrast is insufficient, make the next exposure at a greater distance from the light, equalising the exposure for the increased distance in accordance with the directions already given. I shall next describe the operations of making lantern slides by copying through the camera, leaving the question of development for a future chapter. The process of development is identical whether the slide be made by contact or in the camera.

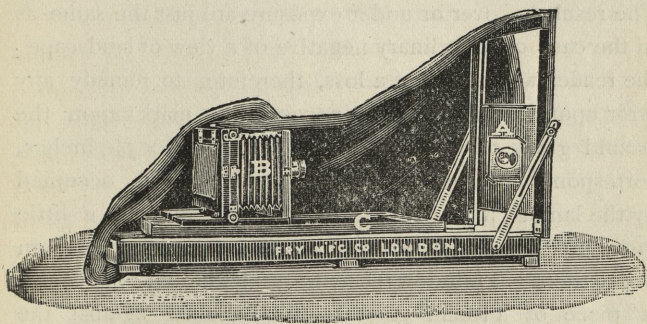
CHAPTER IV.

SECOND METHOD—BY COPYING IN THE CAMERA.

Ⓖ O those who can find time to make their lantern slides by copying in the camera it may be pointed out that there are many advantages which this method has over that described in the foregoing chapter. The power to obviate defects in their negatives—in other words, to dodge them; greater facilities in printing in clouds, the opportunity of selecting any portion of the negative desired, and by enlargement or reduction to make it fit the whole slide, the opportunity for locally exposing in or reducing the exposure of parts of the original negative; the possibility of making a slide from a negative which is not dry or even completely washed; all these advantages belong to the second method, and are of value to the worker. In fact there is no doubt that better results can always be obtained by the copying method, and it is therefore recommended in every case and even if the slide desired be from a negative measuring $3\frac{1}{4}$ by $3\frac{1}{4}$.

Making a lantern slide by copying in the camera is simply photographing a negative by transmitted light—that is to say, the negative takes the place of the view or group, and the light is passed through the negative to the lens of the camera, and thence on to our sensitive lantern

plate. It is therefore necessary to have some mechanical means of holding up the negative to the light, so that a camera and lens can be pointed to it. Extraneous light between the lens and the negative must be cut off, or the resulting slide will not be bright and clear. Any device by which this end may be attained will suffice. A suitable apparatus is shown in the accompanying block-



THE "DRESSER," ENLARGING AND REDUCING APPARATUS.

The negative is placed in a carrier A, which is arranged so that it can be raised or lowered or turned round. A piece of finely ground glass should be placed behind the negative, or a piece of white card or opal, at an angle of 45° to reflect the light evenly through. A Camera and short-focussed lens is placed at B. It is necessary that the front of the camera and the carrier A, should be parallel. The size of the image upon the ground glass is then adjusted and brought to a focus by means of the pinion on the camera, and by pulling out the sliding frame C on to which the camera is fastened. A lantern plate is then placed in the dark slide. The focussing cloth is thrown over the whole

apparatus in such a manner as to exclude all light except such as passes through the negative. The exposure is then made. With regard to this, much depends upon the position in the room of the apparatus, and the actinic strength of daylight at the time, but with diaphragm $f/16$, close to a window, and average light and density of negative, an exposure of two minutes may be reckoned upon. The results of over or under exposure are just the same as in the case of an ordinary negative of a view or landscape : the reader will not be at a loss, therefore, to remedy any error upon this point. It is necessary to mark upon the ground glass of the camera a square $3\frac{1}{4} \times 3\frac{1}{4}$ inches, corresponding in position with the place to be occupied by the lantern plate. It will be obvious that with a little ingenuity, slides may be made in a camera in any room where there is a window receiving a fair amount of daylight. A piece of ground glass may be placed against the window, the negative (film towards the camera or the transparency will be facing the wrong way, technically known as reversed) fastened to it with gummed paper, and then the rest of the window blocked out with brown paper. The camera may be placed on a box upon a table, and brought within proper distance, care being taken to keep the front of the camera quite square with negative, or the transparency will be distorted. Of course, such makeshift arrangements are not perhaps so convenient if much work has to be done, but it may be satisfactory to the pocket ; and, after all, much good work is done with apparatus that would astonish the owners of expensive outfits.

CHAPTER V

PRINTING IN CLOUDS.

HERE are two methods; both will be described and the choice between them left to the reader with the observation that the writer generally uses the first given.

To print in clouds upon the same plate as the rest of the picture, proceed thus. In the camera expose the plate, carefully shielding the sky portion of the negative from the action of light by means of a piece of cardboard with a serrated edge. Develop the slide, being careful to keep the sky quite clear and free from fog. When development has been carried far enough wash the lantern plate more carefully than usual, *but do not fix it*. Now place a suitable sky negative in the camera and when focussed and adjusted place the lantern plate (wet) in position and expose in the sky portion, *this time carefully shielding the foreground of the negative from further exposure*. The plate will require about twice the exposure because it is wet, but exposures for the sky are always comparatively short. Develop the exposed sky without re-moistening the foreground part with the developing solution; either by tipping the plate up in the dish or by developing locally with a Camel-hair brush, or pledget of cotton wool.

The second method is as follows :—Have at hand a piece of cardboard with a jagged edge, and place this between the negative and the light, so that the sky portion

of the negative is shielded. The serrated edge of the card just covering the junction line of sky and trees, or roof, or whatever it may be. If the card is kept moving during the exposure, upon development it will be found that the sky is quite clear glass. If preferred, the sky portion of the lantern slide may be made quite clear by brushing over the ferricyanide reducer (*q.v.*) This is made by dissolving one part of ferricyanide of potassium in ten parts of water, and adding a few drops of this solution to a couple of ounces of clean fixing bath (hypo), preferably rather weak. Wherever this mixture is brushed upon the film the whole of the image will be dissolved away. A separate lantern slide is then made from a sky negative. It must be so placed upon the $3\frac{1}{4} \times 3\frac{1}{4}$ plate that when the sky transparency and the foreground transparency are put film to film and bound together the sky and the foreground form one harmonious slide. In this case the sky slide forms the cover glass, and that portion of it which is over the foreground of the slide may be cleared away with the reducing solution before mentioned. It must be noted that if the sky slide be made by contact it will be reversed when bound film to film with the foreground slide. For this reason it is always better to make the sky slide by the copying method. It is then quite easy to get a true result. To effect this, the film of the sky negative from which a slide is to be made should not be placed towards the camera as must always be done with a landscape or other negative, but *away* from it. The result is that the sky slide is reversed in position, that is to say, the left side becomes the right. But, as the film is put *against* the film

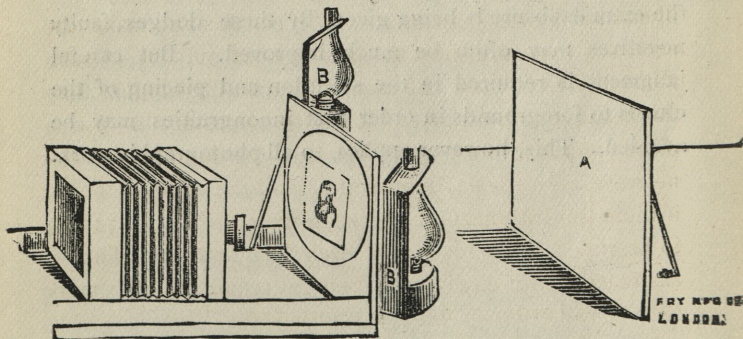
of the foreground slide, the sky portion becomes again reversed, and that is to say, in its right relative position when the light is passed through it. If preferred the sky slide may be made by contact, but the results will be untrue to nature.

Any portion of the slide which appears to require more exposure than the rest may always be "dodged" in by making a hole in a piece of cardboard and shielding the negative whilst the exposure is being made. If the negative has a weak edge or corner it may be remedied in similar manner by shielding with a card or piece of wool. Always keep the card or wool *moving* during the exposure or a hard line will be the result. It makes no difference whether the card be held between the negative and the camera or between the negative and the light, but in the latter case it is more easy to be sure of the spot to which the extra exposure is being given. By these dodges faulty negatives may often be much improved. But careful judgment is required in the selection and piecing of the clouds to foregrounds in order that incongruities may be avoided. This, however applies, to all photographic work.

CHAPTER VI.

MAKING SLIDES IN THE CAMERA BY ARTIFICIAL LIGHT.

SOME amateurs are precluded by their engagements from using daylight for their slide making. Artificial light—a good paraffin lamp—may be used. Place a piece of ground glass, behind the negative, and move the lamp about behind it. The exposure for this method should be twice or three times that of average



ARRANGEMENT OF APPARATUS FOR ARTIFICIAL LIGHT.

daylight or longer. A ground glass chimney to the lamp is an advantage, or if this method be found imperfect, place a sheet of white card-board at a distance of 12 inches


from the negative, and a paraffin lamp *on each side* of it, but at a distance of twelve inches from the card and six or eight from the negative. In this way, only reflected light will pass from the card through the negative, and excellent results may be obtained, although the exposure will be longer than with daylight. The arrangement of the lamps and cardboard will be obvious from the accompanying sketch.

Another method and one which I generally use is the following, but the use of an optical or magic lantern is required. The negative must be placed in the enlarging apparatus shown in the illustration on page 29. Instead of allowing the daylight to pass through the negative at A, an optical lantern is placed in the side opposite to the camera B. The cone of light proceeding from the lens is then directed to shine through the negative in such a way as to illuminate it evenly all over. To effect this and make the necessary exposure short the lantern need only be at such a distance as to make the circle of light a little bigger than the negative to be copied. It will be necessary to use a piece of finely ground glass between the lantern and the negative as in the daylight method and the effect is better if there is a little distance between them. The great thing to be aimed at is to secure even illumination. This is easily effected if daylight be used but requires a little more care should artificial light be resorted to.

There is no insurmountable difficulty, and a person of ordinary intelligence will easily manage the light and secure results altogether equal to those produced by daylight.

CHAPTER VII.

DEVELOPMENT.

 THE developing processes are identical, whichever method of making the exposure be adopted. The leading ideas are—

Exact exposure.

Prompt development, without forcing of the image.

Clean manipulation.

Technical excellence.

The question of exposure has been already dealt with in previous chapters, and upon the successful application of the principles laid down depends the possibility of successful development. All detail and sufficient density should be attained in four to eight minutes. but this depends upon the developer selected, and the temperature of the solution. With my pet developer, sulphokinone, in summer the time just given will be required, but in winter or cold weather longer. Temperature greatly affects the progress of development. Dishes and measures must be scrupulously clean, for the slide is not, as is the case with a negative, the means to an end, but the end itself. The developer should be recently mixed, not stale. The hypo fixing bath fresh every time of slide-making. For my part I am

inclined to believe there is nothing better than hydrokinone for developing lantern plates—at all events for beginners—and I give first place to that.

FORMULÆ FOR HYDROKINONE DEVELOPER FOR LANTERN PLATES.

No. 1.—CONCENTRATED SOLUTION.

Hydrokinone	..	..	..	2 drams or 10 parts
Acid-Bisulphite of Potass.	..	..	1 dram	„ 5 „
Water to make	..	..	10 oz.	„ 400 „

Use hot water and mix 12 hours before required for use.

No. 2.—CONCENTRATED SOLUTION.

Carbonate soda	..	..	..	4 oz. or 4 parts
Water to make	..	..	..	10 oz. „ 10 „

No. 3.—CONCENTRATED SOLUTION.

Carbonate potass..	..	..	..	1½ oz. or 1½ parts
Water to make	..	..	..	10 oz. „ 10 „

No. 4.—CONCENTRATED SOLUTION.

Potass. hydrate (caustic potass)	..	..	..	220 grains or 1 part
Water to make	..	..	..	10 ozs. „ 20 parts

No. 5.—CONCENTRATED SOLUTION.

Potassium bromide	..	..	..	1 oz. or 10 parts
Water to make	..	..	..	10 oz. „ 100 „

No. 6.—CONCENTRATED SOLUTION.

Ammonium Carbonate	..	..	..	1 oz. or 10 parts
Water to make	..	..	..	10 oz. „ 100 „

No. 1 solution contains the hydrokinone, which is the actual developing agent, and No. 5 is the restrainer, which is always recommended to be used. It is well to have the bottle containing the restrainer ready to hand during development. In case of over-exposure it can be used at once. Solutions Nos. 2, 3 and 4 contain the alkalis, or accelerating agents, and can be used singly, or in combination. Each has its characteristic quality. No. 2 has the tendency to give full detail with medium density. No. 3 gives

greater density, and not so much detail. No. 4 gives a very black image, especially if only a small proportion of No. 5 be used. Nos. 2 and 3, compared with No. 4, both incline to give a yellow stain in the clear portions of the slide if it be under-exposed, and this may necessitate passing through an acid clearing bath. No. 4 is less subject to this defect, but is more apt to induce frilling, owing to its very caustic nature. With No. 2 or No. 4, and as much as 60 minims of No. 5, and same quantity No. 6, and three times the correct exposure of the plate for black tones, warm brown tones will be obtained. The development takes longer in this instance.

I recommend the beginner to start by using Fry's "Sulphokinone" Developer, unless he wishes to plunge *in medias res*, when he should adopt either No. 2 or No. 3 as accelerator, as follows:—

DEVELOPER FOR USE.

No. 1 solution	..	..	..	..	..	1 part
No. 2 or 3 solution	..	..	..	..	..	1 ..
Water	..	..	..	..	..	8 parts

and add two drops of restrainer (No. 5) for each ounce of mixed developer.

It is not good policy to use so little developer as not to cover the plate easily during development. It is better to use a liberal allowance—for instance, 2 oz. to a $3\frac{1}{4} \times 3\frac{1}{4}$ plate—and then to develop three or four, following each other in the same solution. It is not advisable to attempt to develop a larger number than that just mentioned in the same solution. More can be done, but, upon examination, a great difference in density and detail will be noticed

between the first and last. I do not recommend it to the careful worker; nor do I find one-solution developers reliable in my hands. There is no power of adjustment, and my experience is against their use.

I have now brought the reader to the point when actual development of the exposed slide is to commence. Once again let me urge the importance of having everything clean and all solutions separate. Especially should measures which are to be used be washed free from all contamination of other chemicals before proceeding to measure fresh solutions. Fingers are capital means of carrying the fixing solutions into the developers, etc., etc., and *vice versa*. If you *must* put your fingers into the solutions use one hand for lifting plates in developing solutions, and the other for touching the fixing bath. But, whatever happens, it is as important not to "mix" in the developing room as in more convivial occupations.

Having mixed the developer as directed on page 38, place the exposed plate in a clean dish, preferably a wooden one with glass bottom, and flow the mixed developer over it. When using the developer *a second time* it is imperative to soak the plate in clean water for two minutes before flowing on developer. If this point be not attended to, air-bells, scum, or other surface defects may be occasioned. With hydrokinone, development begins but slowly, but when details do appear then watch your plate carefully. Both density and detail are rapidly gained towards the end of development if the exposure has been approximately correct. The development of a lantern slide cannot be forced. It is best to get full density, as it is easier to reduce than

to intensify. Develop (and in the meantime keep the solution gently moving over the plate) until all the detail which is in the original negative can be seen in the transparency now being made. Of the density a trial or two will give more useful experience than pages of instructions, but remember that you cannot do with more density than the light from the exhibiting lantern can penetrate. A most excellent plan is to buy or borrow a slide of proper density, and carefully examine it through the lanternscope (see Chap. IX.), fixing the maximum density in the recollection, and bearing in mind that the transparency requires to appear rather more dense before it is fixed than it is required to be when freed from unused bromide. Having obtained all the necessary detail and sufficient density, remove the plate from the developer and thoroughly wash it under the tap. Sometimes it will be found that parts only of the transparency require more development. To effect this wash the plate carefully and effectually, and then re-apply new and full strength developer locally with a camel hair brush until the desired local effect is produced. The slide being thoroughly wet, the developer will spread a little, and there is practically no risk of leaving a hard line where the developer is re-applied if the brush be kept moving. When the local development is complete, wash again. Do not be afraid to get the developer out by thorough washing. It is an error in judgment to rush the transparency into the fixing bath but half washed. The plate becomes stained, and this has afterwards to be removed in the clearing bath. Do not expose the transparency to white light of any sort until completely fixed. It may spoil the purity

of the shadows which should be clear glass and quite transparent. Do not use alum before fixing. If the plates being used require it to prevent frilling, they are rubbish and should be discarded. If density is obtained before all detail is out, probably the plate is under-exposed.

Should detail be all present, but there be a difficulty in getting density, over-exposure is indicated. How to deal with exposure is fully treated upon in Chapter II. After careful washing, place the plate in the acid fixing bath made as follows—

Soda hyposulphite	..	..	..	..	5 parts
Soda Acid-Bisulphite	..	..	..	..	1 „
Water	..	..	..	..	20 oz.

Let it remain in this bath for five minutes after the creamy appearance of the film has quite gone. This will ensure the slides against changing colour or staining afterwards. The time indicated is not too long, and I urge the point. It applies with equal force to all photographic processes in which hyposulphite of soda is used to dissolve out the unreduced salt of silver. After thorough fixation, wash the transparency thoroughly in running water to eliminate the hypo. A piece of cotton-wool may be used to rub over the surface or film to expedite the washing.

When washed the plate may with advantage be passed through a clearing bath for 20—30 seconds.

CLEARING BATH.

Alum (ordinary white)	..	..	..	2 oz.
Hydrochloric acid	..	..	..	2 drs.
Water	..	..	..	20 ozs.

Should the slide, when viewed by holding it against a piece of white paper, or opal held at an angle in such a way as to reflect the light through the plate, appear yellow, pass it through the clearing bath again until the yellowness has gone. Only in case of severe error in exposure, will it be found necessary to resort to this persistent use of the acid clearing bath. Thorough washing must follow, and the slide be put upon its corner, or in a rack to dry.

When dry, examine the slide carefully; if too dense, it can be reduced by the following method:—

REDUCING BATH.

Hyposulphite soda .. .. .	.. .. .	1 part
Water .. .. .	.. .. .	10 parts
Saturated solution of ferricyanide of potass.	{ 3 drops to each ounce of the solution	

The mixed bath will not keep, and its action depends upon the amount of ferricyanide (not ferrocyanide) which is present. The ferricyanide is the reducing agent, and more may be added until the reduction takes place with sufficient rapidity. Thoroughly wet the slide to be reduced by soaking in a dish of clean water. Then place the plate in the reducing bath until the density is right. The slide may be altered in one part and not in another by applying the reducer with a camel-hair brush locally, as described for development. In this way too heavy deposits may be modified and the slide generally made to conform to the worker's ideas. Occasionally it may happen that a slide may be spoiled by fog or over-exposure and development. This may generally be remedied by placing the slide in the reducing bath until the plate is clear from fog. It

will then be too thin, but after washing it may be intensified and made into a passable picture. There is no result quite so good as can be obtained by correct exposure and development, but sometimes the knowledge how to dodge a faulty slide becomes invaluable. Before giving details of the best methods of intensification and toning, I will touch upon developers other than hydrokinone. Any developer which can be used for negative work will do. Only those which are capable of giving "nice-looking negatives" should be tried. They are—

1st. Pyrogallic acid and ammonia.

2nd. Pyrogallic acid and fixed alkalis, such as carbonate of soda or potassium.

3rd. Ferrous oxalate.

4th. Pyro in combination with meta-bisulphite of potassium.

All these yield good results, and are advocated by their votaries as *the only* method. It is for the worker to try and judge for himself. The rules for development are the same, whatever be the agent. I shall give a well-tried formula for each, and endeavour to state the advantage and disadvantage of each in order. 1st. *pyro and ammonia*. This is so well-known a form of developer that it is hardly necessary to do more than state that it is a trifle more difficult to obtain results free from stain than with other forms. The colour is generally a black or yellow-green.

Very nice slides can be made with this modification of the pyro developer, using the No. 2 or No. 3 solution (page 37) as the accelerator and pyrogallic acid solution, as follows:—

CONCENTRATED PYROGALLIC SOLUTION.

Acid, pyrogallie	..	..	..	..	1 oz. or 8 parts
Acid, citric	..	..	..	..	60 grs., 1 part
Water to make	..	..	..	..	10 ozs., 80 parts

PYROGALLIC AND FIXED ALKALIS.

For use :—

Water	..	..	..	..	3 oz.
Con. pyro (as above)	..	..	..	..	90 minims
Restrainer No. 5	..	..	..	..	3 "
Fixed alkali (see page 39) No. 2 or 3	..	..	..	..	5 "

Development proceeds exactly as indicated for hydrokinone, but the developing solutions can only be used once. If to the concentrated pyrogallie solution 4 parts of meta-bisulphite of soda be added, the colour of the image will be of a fine black, and development be much less liable to dirty stains. More exposure will in this last case probably be required, but that hardly matters. This is the fourth method previously referred to. The following is a good method of developing lantern slides to a purple tone by the use of pyrogallie acid and ammonia.

If the skies are not sufficiently opaque they must be stopped out.

The solutions required are ten per cent. ones of the following :—Pyrogallol, bromide of potassium, liquor ammonia, carbonate of ammonia, and carbonate of potass.

The pyro is mixed as follows :—Four ounces of sulphite of soda are dissolved in boiling water and rendered acid with citric acid. The pyro is then added, and the whole made up to ten ounces with water.

The other chemicals are simply mixed with water, and all will keep well. A developer giving a beautiful purple tone with Fry's plates is—

Pyro solution	..	..	..	..	..	30 minims
Bromide	..	..	..	..	..	40 "
Ammonia	..	..	..	..	..	30 "
Carbonate ammonia	..	..	..	..	..	30 "
Water to make up to	..	..	..	..	..	1 ounce

The exposure must be slightly increased to get the purple tone, while a fine engraving black is obtained by shortening the exposure, increasing the ammonia, and leaving out the carbonate of ammonia.

Sepia is obtained by full exposure and using carbonate of potass or soda in place of ammonia, but some makes of plate will not yield the sepia tone.

There remains ferrous oxalate. I do not recommend it.

It is more difficult to prepare and to keep ready for use. It is liable to leave a deposit of oxalate of lime on the film, which looks white, and it is almost impossible to use it in the same sink or dishes as are used for pyro or hydrokinone. Here is the formula, however. The colour of image is a good black.

Oxalate potass.	..	..	6½ ozs.	..	2,800 parts
Proto-Sulphate Iron	..	..	2½ ozs.	..	1,100 parts
Citric acid	..	..	100 grs.	..	100 parts
Bromide potass	..	..	10 grs.	..	10 parts
Water (hot, and preferably distilled) to make	..	..	20 ozs.	..	10,000 parts

This it will be observed, is a one-solution developer against which I have declaimed. This formula is much simpler to use than one in which the oxalate and iron are separately dissolved. It is much more easy to prepare and, moreover, works quite as well. In developing lantern slides with ferrous oxalate it is advisable to put the plate straight from the developer into a 1 per cent. bath of hydrochloric

or acetic acid, which must be perfectly washed out before the plate is put into the fixing bath. If this point is not attended to, the acid will cause a deposit of sulphur in the plate, which is fatal in every way, and must be avoided by care in previous operations. All other points in development are the same as those already given for hydrokinone.

The various methods of development have now been put before the reader, and I trust in such a manner as to lay bare the methods which he must adopt to obtain good results from his early endeavours. I strongly counsel him to become acquainted in a practical way with the formulæ and method here enumerated before attempting any divergence from this beaten path of practice, but that is for him to decide. I am sure that he will be able to make slides of passable quality from his earlier attempts by closely adhering to the instructions given in the foregoing pages, and that is all I undertook to do for him, I trust with success.

CHAPTER VIII.

INTENSIFICATION AND TONING.

AFTER the slide is fixed, and washed, and dried, it may sometimes happen that there is a lack of density. It is very convenient to be able to increase this contrast. This is called intensification. In addition to the power of intensifying the deposit, the colour of it may be altered. This is called toning.

INTENSIFICATION.

Attention has been already called to the importance of thoroughly removing all the bromide of silver (see page 41) by leaving the slide long enough in the hyposulphite of soda solution. This is doubly important, if there is a possibility of having to intensify or tone.

Should the slide have been imperfectly fixed, *i.e.*, left an insufficient length of time in the hypo bath, the intensification will be irregular, and stains, which cannot

be removed, will certainly be a result. The deposit will not be permanent. On the other hand, if properly fixed and washed, there is little reason to fear any change in the slide.

The best, and at the same time the most easy, method of intensification is as follows:—Prepare a saturated solution of bichloride of mercury (this is a very poisonous chemical, and care must be taken to keep it in a place of safety) by dissolving, say, $\frac{1}{2}$ oz. in 10 oz. of hot water. When cold, much of the bichloride will have crystallised out, but the supernatant solution will be ready for use. The slide which it is required to intensify is placed in a clean dish containing sufficient of this solution to cover it. The film should turn white (this is called bleaching), and when it is white right through to the glass, the slide should be removed from the dish and carefully washed. This may be done in day or white light. After washing for ten minutes, place the plate in the hydrokinone developer recommended on page 38 until the white image has once more become dark. Then wash again for ten minutes, and the intensification is complete, and the colour of the deposit will be found to be very good. If density is still insufficient this process of intensification may be repeated any number of times until the required density has been obtained. Several colours can be obtained at will by varying the process after bleaching with mercury.

Toning by Intensification.—In order to obtain various tones, the following methods may be adopted after the bleaching operation, and in place of the re-development described above.

No. 1. Brown Tone.—After bleaching, well wash the slide and place in the usual 20 per cent. hypo bath (see p. 41). The result will be a brown tone, more or less rich according to the original exposure. The longer the exposure, the redder the tone.

No. 2. Warm Black.—In order to obtain this, immerse the slide, after bleaching, in a saturated solution of sulphite of soda. A few drops of ammonia added to the sulphite will yield a purple black tone.

No. 3. Reddish Brown.—Immerse in a saturated solution of washing soda. By mixing Nos. 2 and 3 in various proportions, the reader may obtain several other tones for himself.

TONING.

To obtain a purple red, place the dry slide in a sulphocyanide combined fixing and toning bath, such as is recommended for Aristotype prints. The following is a good one:

PURPLE-RED TONING BATH.

Chloride of gold . . . . .	.. .. .	1 gr.
Sulphocyanide of ammonium .. .. .	.. .. .	25 grs.
Hyposulphite of soda .. .. .	.. .. .	240
Water .. .. .	.. .. .	2 ozs.

Dissolve the gold in the water and add last.

The slide, when placed in this bath, quickly takes a purple tone. The bath should be prepared twelve hours before required for use.

To obtain a bluish-black color by toning, place a slide in a bath composed of—

BLUE-BLACK TONING BATH.

Sulphocyanide of ammonium .. .. .	.. .. .	40 grs.
Carbonate of sodium .. .. .	.. .. .	2 ..
Water .. .. .	.. .. .	4 ozs.

1 gr. gold dissolved in little water, add last, and at time of using.

When the desired tone is obtained, remove the plate from the bath and wash it.

The color or tone given by the above bath may be varied at will by increasing or reducing the amount of sulphocyanide. Increase of sulphocyanide yields bluer tones; decrease tend to blackness. The toning of slides before drying tends to increase the depth of color, the time taken being only from two to three minutes. But if the slides are allowed to dry first, the subsequent toning is slower and more gradual. On the whole, the latter course is to be preferred if time be no object, as the process may be more carefully watched.

PURPLE TONES.

Slides may be *developed* to a purple tone by method described on pages 44 and 45.

VARIOUS TONES.

Place the slides to be toned in the following solution for one minute :—

Sodic Sulphite	..	..	..	..	1 oz.
Sulphuric Acid	..	..	..	..	$\frac{1}{2}$ dram.
Water	..	..	..	..	3 ozs.

Wash carefully for a few minutes under the tap and then immerse in the following bath :—

Nitrate of Uranium	..	..	..	15 grains.
Water	..	..	..	2 ozs.
Methylated Spirit	..	..	..	$\frac{1}{2}$ "
Solution of Ferricyanide of Potassium a sufficiency.				

The number of drops of the last chemical determines the colour of the tone obtained. The action is very quick and must be carefully watched. Do not add too much of the ferricyanide of potassium to begin with. Tones are

given in the following order, viz., brownish black, chocolate, reddish brown, orange. As soon as the desired tone has been obtained, remove the plate *quickly* and wash it under the tap, and let the drying of the slide be performed as quickly as possible. Tones obtained by this method are removed by soaking the toned slide in either liquid ammonia, or a solution of carbonate of soda. The process can thus be repeated if success does not seem to crown one's efforts, or if the desired tone is allowed to pass by before the process is stopped.

Since the first edition of this book was written, considerable attention has been given to uranium toning. The method is an attractive one, for excellent and most charming results can be obtained. Slides developed with ferrous oxalate are difficult to tone, unless great care has been taken to get rid of all traces of iron, which causes irregular blue staining. The best results can be obtained with Sulphokinone (or Hydrokinone). Give a full exposure in the first instance. The best results are obtained from a plucky slide. As toning slightly increases the density, a *thick* slide will become too dense after toning by this method. A *good* slide will tone to a rich brown tone, a *thin* slide to a reddish color.

The toning bath is made as follows:—

Uranium Nitrate ..	20 grs.	Ferricyanide of potass. ...	20 grs.
Acetic acid	$\frac{1}{2}$ oz.	Acetic acid.	$\frac{1}{2}$ oz.
Water to	10 oz.	Water to.	10 oz.

For use mix equal parts of each. The mixed solution will not keep. Place the slide in the mixed solution, rock

the dish until the color changes sufficiently, bearing in mind that the subsequent washing very slightly reduces it. It is important that the washing should be carefully and evenly effected, or irregularity of color will result. To make the toning redder, wash the plate after toning, then place it in an acid alum bath.

Alum (saturated solution.)	..	..	..	..	1 oz.
Water. . . . .	..	..	..	..	1 oz.
Hydrochloric acid	..	..	..	..	40 drops

The tone will become redder the longer the slide is left in. If a very rich color be required, the toning should be carried farther in the uranium bath.

To obtain a brick red. After the toning, place the slide in a clean Hypo bath for 30 to 40 seconds. Then wash. Too long immersion will reduce the density.

CHAPTER IX.

THE slide has now arrived at that point at which it is ready to be cleaned up and bound to a cover glass. This should always be done in order to protect the hygroscopic gelatine film from damage by moisture or scratching. It is necessary too, to make the slide in such a way that any person who may have to show it in the lantern, may readily be able to distinguish the right from the wrong side. Nothing is more disturbing to the equanimity of a lantern slide exhibitor than to discover that he has put a slide into the carrier the wrong way. The audience will soon acquaint him with the

fact if it occurs. To obviate the possibility of this mishap it is usual to place two white spots—one in each



top corner of the slide as held in the hand for viewing. The illustration shows this quite clearly.

There is a very handy little instrument called a **Lanternscope** which I have found useful, as it serves to test one's slides before mounting. It is, moreover, useful, as the transparencies may, by its aid, be viewed by the daylight, and at times when the erection of the screen and lantern is inconvenient. Lantern slide makers should own one of these instruments. The usual method of mounting is to place a paper mat or mask upon the slide in such a manner as to present a picture upon the screen, the boundary line of which shall be of a shape which as far as possible harmonises with the picture itself. These masks are sold by dealers in photographic materials in various shapes, viz., Circular, cushion (a square with the corners all rounded); dome (a square, with the two top corners only rounded, the bottom corners being left square); oval; a square or oblong. The reader will

be able to decide in each case which shape he thinks most suitable to the subject in hand. I am informed also that masks with the white spots already printed upon them will be on sale ere this edition is in print. A piece of clear glass is then bound down to the slide, using narrow strips of black needle paper, already gummed, and which may also be purchased for a trifling sum of the dealers aforesaid. The strips are moistened, and then pressed over the edges of the two glasses in such a manner as to fix them together. Every reader has probably seen a finished slide and will know how to complete one. Of course, if a sky has to be added to the slide, no extra cover glass will be required.

I need hardly advise that the film must be quite dry and the paper mat free from moisture before the whole slide is bound together. If this point be not attended to, the moisture will become apparent as steam when the slide is placed in the lantern for exhibition, and the effect of the slide will be spoiled. Some slide makers prefer to varnish their slides before mounting them. This is on the safer side, and a good crystal varnish should be purchased from a respectable dealer.

It now only remains to me to make my adieux to the reader, supposing him to have been indulgent enough to follow me so far, and parenthetically to observe that the assumption that the reader is of the sterner portion of humanity is one of convenience in writing only, for I cannot imagine a pursuit likely to be more acceptable to the gentler sex than that of making photographic lantern slides, and I commend it to them in hope. It is

my desire to add to my farewell the hope that these few pages may help the reader to an acquaintance with this **most** enjoyable branch of photographic work, and that I may have the pleasure of again appearing before him in future editions of the book.

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